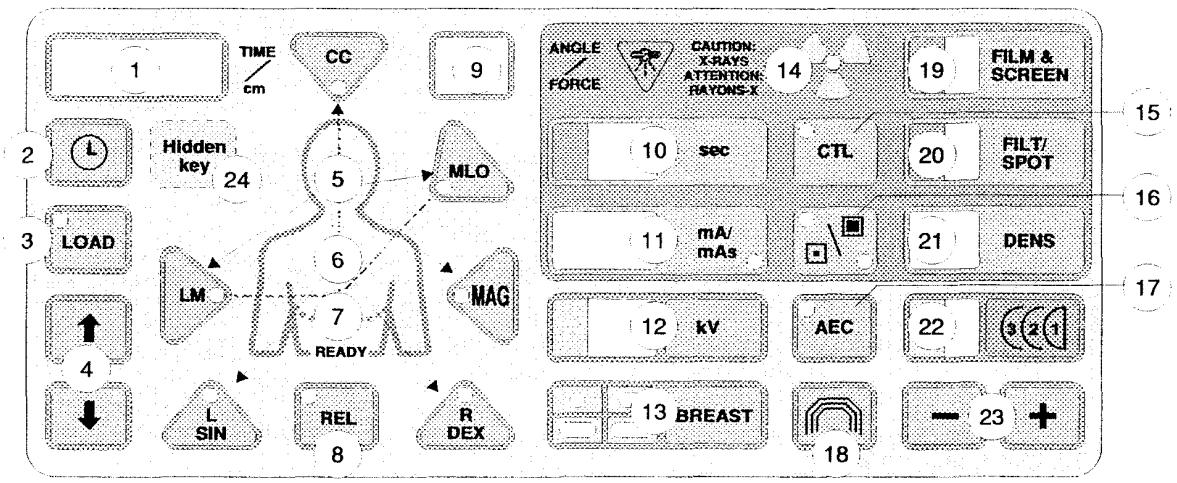
Chapter C

KEYBOARD FUNCTIONS & MODES

1 KEYBOARD OVERVIEW

This chapter describes all keyboard functions in a short-form format, and special display modes in details. For detailed descriptions about adjustments and settings performed with the help of the keyboards, please refer to chapter "ADJUSTMENT & CALIBRATION" on page F-1.

The unit's keyboards works in parallel and are identical (see picture below). However, if one of the keyboards would fail, it is still possible to operate the unit using the other one, since the keyboards operate electronically independently.



(1) Display; Time of day / breast thickness / Error-Help-Stop-messages / Wait time/Phase time
(2) Clock key, displaying and programming time-date-year data
(3) Load key, used for cassette loading/unloading
(4) Height adjusting keys, drives unit up/down
(5) Projection angle selection and display keys
(6) Breast selection and display keys
(7) READY-light, turns on when unit is ready for exposure
(8) Release key, releases the breast compression
(9) Display; projection angle or breast compression force
(10) Exposure duration select and display
(11) mA or mAs select and display
(12) kV select and display
(13) Quick setting selection and programming
(14) Exposure warning indicator
(15) CTL- key for performing special functions
(16) Focal spot size selection and display
(17) Manual / AEC / AAEC -exposure selection and display
(18) Beam collimation adjustment and light field activation key
(19) Used film/screen combination selection and display
(20) Filter/spot collimator selection and display
(21) Density selection and display
(22) Radiation sensor selection and display
(23) Parameter adjustment/change keys
(24) Hidden key (only for service mode entry)

2 USER MODE FUNCTIONS SHORT-FORM

2.1 Normal user functions

The keyboards are always in the normal operating mode when the unit is turned on. Please refer to the SOPHIE USER'S MANUAL for descriptions for the normal keyboard operation and instructions for normal everyday use of the unit.

2.2 Special user settings

There are some adjustments that the user/operator can perform to set the unit to fulfil individual needs. The following table is a short-form of these functions. Please refer to the User Manual for more detailed descriptions.

How to access these special user settings

Press the CTL-key (it's LED turns on) and then press the corresponding button. Some of the settings (especially infrequently used ones) requires that the corresponding button is held down for three (3) seconds, preventing inadvertent entry into these modes. Exit from these special user functions is either automatic or done by pressing again the CTL-key, see details in table below.

Table 3: Special user settings

USER MODE FUNCTION	KEY SEQUENCE	FOR DETAILS, PLEASE REFER TO
AEC MODE OF OPERATION	CTL → AEC	"AEC mode of operation (AEC/ AAEC)" on page F-2
AUTOMATIC kV MODE	CTL → kV → − + → CTL	"Automatic kV mode" on page F-2
AUTOMATIC RHODIUM/MOLYBDENUM FILTER SELECTION MODE	CTL → FILT/ SPOT (hold for 3 seconds) → − + → CTL	"Automatic rhodium/molybdenum filter selection mode" on page F-2
DEFAULT MAGNIFICATION FACTOR	CTL → MAG → − + → CTL	"Default magnification factor" on page F-3
AUTOMATIC RELEASE OF COMPRESSION	CTL → REL	"Automatic release of compression after exposure" on page F-3
PROGRAMMING QUICK EXPOSURE SETTINGS	CTL → BREAST → CTL	"Programming quick exposure settings" on page F-3
MAXIMUM COMPRESSION SPEED	CTL → L SIN (hold for 3 seconds) → − + → CTL	"Maximum compression speed" on page F-4

Table 3: Special user settings (Continued)

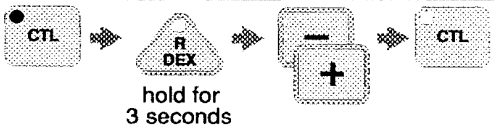
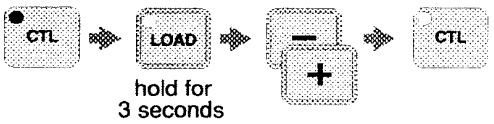
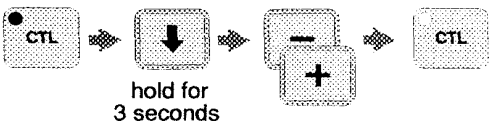
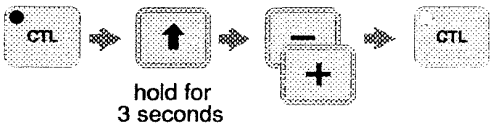
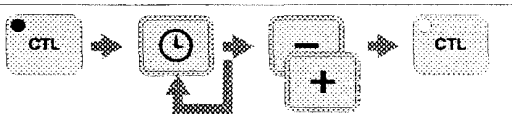
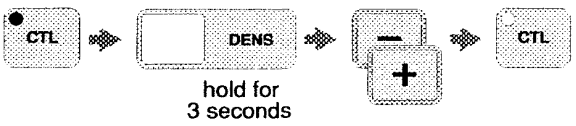
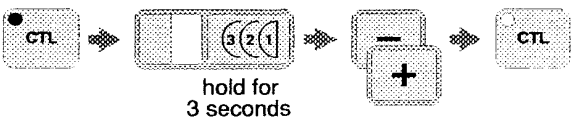
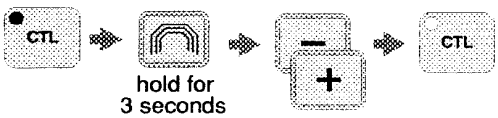
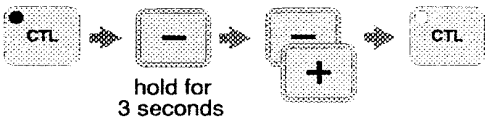
USER MODE FUNCTION	KEY SEQUENCE	FOR DETAILS, PLEASE REFER TO
COMPRESSION RETARDATION RATIO		"Compression speed retardation ratio" on page F-4
INTERMEDIATE COMPRESSION STOPPING FORCE		"Intermediate compression stopping force" on page F-4
TWINCOMP COMPRESSION ON/OFF		"Twincomp compression on/off" on page F-5
LIFT MOTOR CRAWLING SPEED		"Lift motor crawling speed" on page F-5
TIME & DATE ADJUSTMENT		"Setting correct time and date" on page F-5
TRANSPORT POSITION (TO/FROM)		"Transport position" on page C-8
DENSITY COMPENSATION ADJUSTMENT		"Density offset adjustment" on page F-5
AAEC CONTRAST ADJUSTMENT		"AAEC contrast adjustment" on page F-6
AUTOMATIC FILM LABELING (ON/OFF)		"Automatic film labeling (on/off)" on page F-6
DISABLE BUCKY GRID MOVEMENT		"Disabling bucky grid movement" on page F-6
ALARM SOUND FREQUENCY (loudness)		"Alarm sound frequency (loudness)" on page F-6

Table 3: Special user settings (Continued)

USER MODE FUNCTION	KEY SEQUENCE	FOR DETAILS, PLEASE REFER TO
ACTIVE TIME FOR SETTING VALUES	CTL → sec → − / + → CTL hold for 3 seconds	"Duration of the parameter time-out" on page F-7
IGNORE ERRORS TEMPORARILY	CTL hold for 3 seconds	"Ignore errors temporarily" on page C-10
SERVICE MODE ENTRY	CTL → Hidden key hold for 4 seconds	"How to enter the service mode" on page F-8

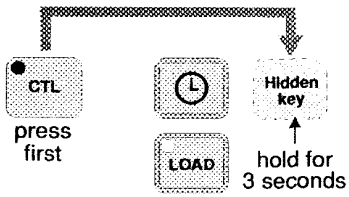
3 SERVICE MODE FUNCTIONS SHORT-FORM

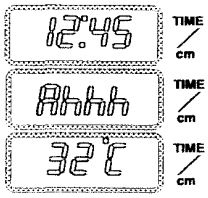
CAUTION ***Some of the functions in the service mode may be jeopardize the proper operation of the unit. Never use special service mode functions if you are not familiar with how they operate. The service mode is only intended for the trained technician.***

The service mode provides easy diagnostics and special setup and calibration functions. Additionally there are also some special control and display modes that are not normally available.

The normal time-of-day display is replaced in the service mode with a temperature display. The unit operates normally and exposures can be made in the service mode, but with few exceptions. The unit also ignores user related errors (missing cassettes etc.) and can make exposures as long as no safety hazards are violated (open feedbacks etc.)

3.1 How to enter / exit the service mode





Normal mode

Entering service mode...

Service mode entered...

a) Press the **CTL**-key so that its LED turns on.

b) Press and hold the **HIDDEN**-key for **3 seconds** (2 cm to the right of the CLOCK-key. The TIME/ CM-display shows briefly the message "**Ahhh**" and then turns to display the temperature of the tube head. This is an indication of a successful entry into the service mode.

To exit from the service mode

Press the **HIDDEN**-key briefly, or turn off the unit temporarily.

3.2 Meaning of displays in the service mode

Some of the normal displays have additional meanings in the service mode. Please see the following table.

Table 4: Meaning of displays in the service mode

DISPLAYS	DURING STANDBY	DURING EXPOSURE
12:45 TIME / cm	Tube head or power supply temperature (°C), waiting time (blinking), breast thickness, help & error messages	Briefly after the exposure; time difference (in milliseconds) between the anode motor windings. Used only for factory diagnostic purposes.
0.6 sec	Selected exposure time (in manual mode only)	Actual measured X-ray tube cathode filament voltage (V)
28 kV	Selected kV	Actual measured X-ray tube anode voltage (kV)
110 mA/ mAs	Selected mA or mAs	Actual measured X-ray tube anode current (mA)

3.3 Service mode settings & special displays

NOTE ***Make sure that the unit is in the service mode before performing the functions described in the following table. Some key sequences might have another meaning if not in the service mode.***

Generally special service modes are entered by pressing the CTL-key (so that it's led turns on) and the respective key either briefly or by holding it for three (3) seconds, please refer to the shortform tables. Many of the special service modes require that you exit by pressing the CTL-key. In those modes the CTL-key LED is kept blinking as a reminder to press the CTL-key again to exit.

The following table is a short-form of all available special service mode keyboard functions. Enter the service mode first before performing any of the mentioned functions (see page C-5).

Table 5: Service mode keyboard function short-form

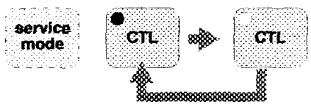
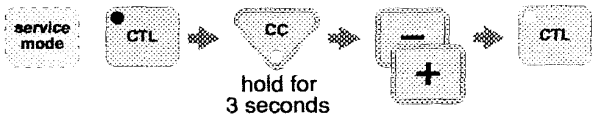
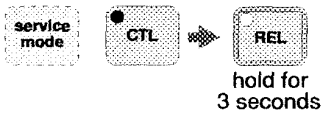
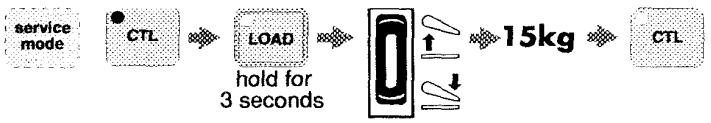
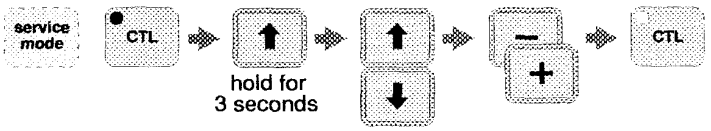
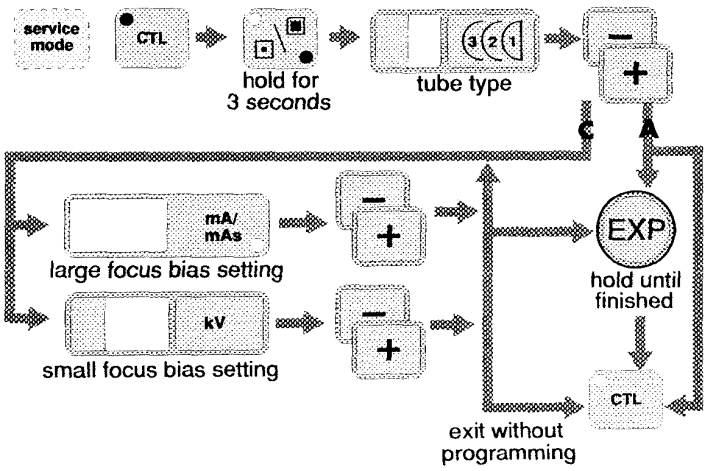
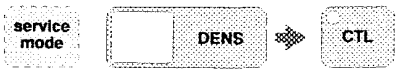
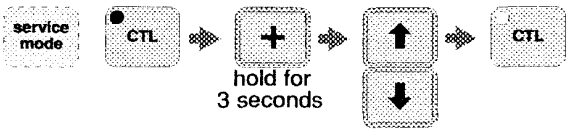
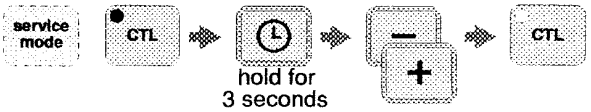
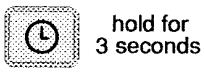
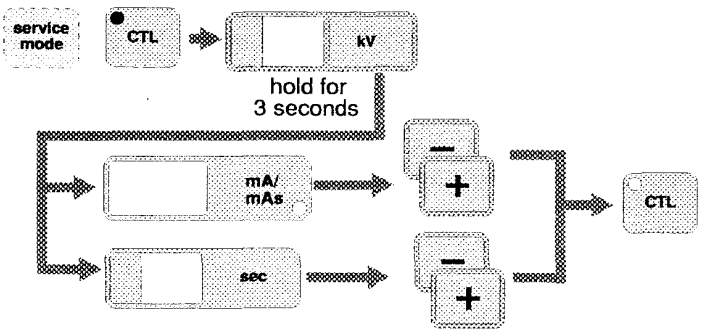
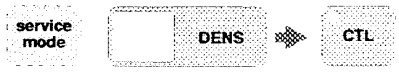
SERVICE MODE FUNCTION	KEY SEQUENCE IN SERVICE MODE	FOR DETAILS, PLEASE REFER TO
DISPLAYING INTERNAL TEMPERATURES		"Display of internal temperatures" on page C-8
C-ARM UPRIGHT POSITION CALIBRATION		"C-arm upright position calibration" on page F-11
BREAST THICKNESS MEASUREMENT CALIBRATION		"Breast thickness measurement calibration" on page F-11
COMPRESSION FORCE MEASUREMENT CALIBRATION		"Compression force measurement calibration" on page F-12
SPECIAL SYSTEM PARAMETERS		"Special system parameters setup" on page F-16
X-RAY TUBE FILAMENT VOLTAGE CALIBRATION		"X- ray tube filament preheating voltage calibration" on page F-13

Table 5: Service mode keyboard function short-form (Continued)

SERVICE MODE FUNCTION	KEY SEQUENCE IN SERVICE MODE	FOR DETAILS, PLEASE REFER TO
AEC-SENSOR CALIBRATION		"AEC-sensor calibration" on page F-14
DISPLAY OF REAL DENSITY VALUE		"Displaying the real density value" on page C-9
EXPOSURE COUNTER DISPLAY		"Displaying the exposure counter" on page C-9
DIAGNOSTIC DISPLAY OF INTERNAL SIGNALS		"Diagnostic display of internal signals" on page C-10
DISPLAY RECENT 49 ERROR MESSAGES		"Displaying the recent 49 error messages" on page C-9
PRINT RECENT 49 ERROR MESSAGES		"Print a list of the recent 49 errors" on page C-10
kV-VALUE FINE-ADJUSTMENT		"kV-value fine-adjustment" on page F-15

4.3 Displaying the real density value



In service mode, press the **DENS**-key and then the **CTL**-key to display the *real density setting*, without the zero compensation (can be set in the user mode).

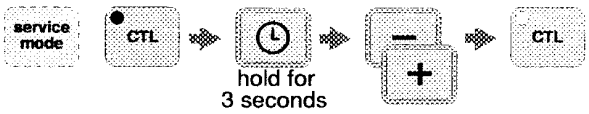
4.4 Displaying the exposure counter

Number of exposures / 10

In the service mode, press the **CTL**-key and then press the **mA/mAs**-key. The **TIME/CM** displays shows the number of exposures divided by ten (10). Press the **CTL**-key to exit from this mode. In the example above the actual number of exposures is ≈ 14.370.

The capacity of the counter is **50.000** exposures, after which it is cleared and starts again from zero. Remember that the exposure counter memory is on the REAR CPU, replacing it also means that you loose the current exposure counter data. The exposure counter can be cleared (together with the error message list), but only by PLANMED. Spare REAR CPU boards have the exposure counter cleared at the factory.

4.5 Displaying the recent 49 error messages

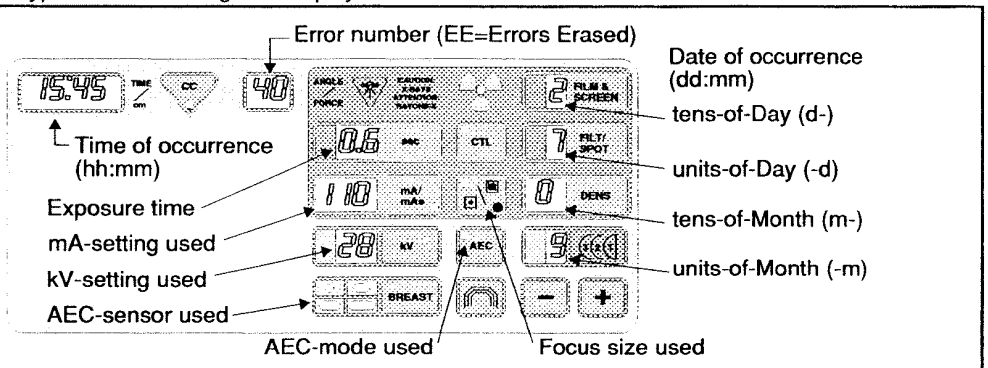


In service mode, press the **CTL**-key and then press and hold the **CLOCK**-key for **3 seconds**. Use the **PLUS/MINUS**-keys to scroll through the list. The MINUS-key steps backwards in the list (and time), the PLUS-key steps forward in the list. Press the **CTL**-key to exit this mode.

The list is always shown in chronological order (by date/time). The maximum length of the list is 49 error messages. The oldest ones are dropped off the list if the list is full and there are new errors that needs to be stored. The list is shorter if there are less than 49 error messages store. It also wraps around from the newest to the oldest error message if you continue pressing the PLUS/MINUS-keys.

The error list can be cleared (together with the exposure counter) but only by PLANMED. The error message list is stored on the REAR CPU, replacing this also means that you loose the error history data. Spare REAR CPU boards have the error list cleared at the factory.

The message "EE" instead of an error number does not indicate an error. It indicates the date and time when the error list was erased (EE = errors erased), Please find below and example of a typical error message list display.



Example; ER40 occurred at 15:45 hours the 27th of September, the exposure time was set to 0.6 sec, current to 110mA, voltage to 28kV, large focus, manual mode and no AEC-sensor

4.6 Print a list of the recent 49 errors

hold for
3 seconds

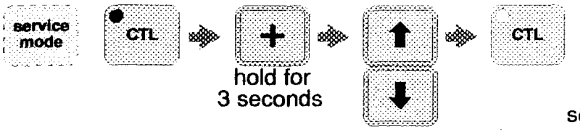
In the service mode, press and hold the **CLOCK**-key for **3 seconds** to print the complete error list on an optional printer. The printing cannot be aborted. Briefly turn off the printer to stop printing.

4.7 Ignore errors temporarily

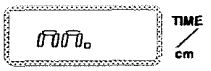
hold for
3 seconds

Pressing and holding the **CTL**-key for **3 seconds** ignores temporarily error codes that are related to motorized movements. This function is useful in situations when the unit needs to be driven to a certain position, but because of an possible error this would not be possible Error that are related with the safety of the unit cannot be ignored this way (such as X-ray tube related problems).

4.8 Diagnostic display of internal signals



hold for
3 seconds



nn = display mode number
segments on the right side of the decimal point indicates the sensor(s) signals(s)

In the service mode, press the **CTL**-key and then press and hold the **PLUS**-key for **3 seconds**. Use the **UP/DOWN**-keys to step to the desired mode, please refer to the details below. Press the **CTL**-key to exit from this special display mode.

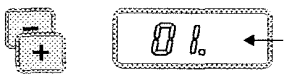
In this display mode it is possible to monitor the signals from virtually all sensors and switches, reaching both the REAR and TUBE CPUs. Additionally, if the sensor(s) selected are related with a motorized function, it is possible to control the related motor with the help of the **PLUS/MINUS**-keys.

CAUTION ***During this mode the sensors that normally operate as limit sensors are displayed but <u>otherwise fully ignored</u>. It is thus possible to drive the respective mechanism past the normal operating range to the mechanical end. Use this feature with care and avoid overloading the mechanisms.***

00. Mirror mechanism Hall-sensor signal & motor drive

right middle segment = magnet at sensor (mirror out of the Xray beam)

01. Filter mechanism Hall-sensor signal & motor drive

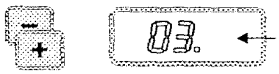


right middle segment = magnet at sensor (filter at position 1 [Mo])

02. Collimator mechanism Hall-sensor signal & motor drive

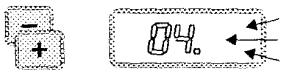
right middle segment = magnet at sensor (collimator at widest field)

03. Labeling disc Hall-sensor signal & motor drive



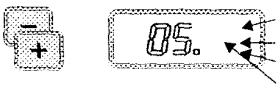
right middle segment = magnet at sensor

04. MAG/LOAD mechanism Hall-sensor signals& motor drive



right upper segment = contact view position sensor
left middle segment = motor rotation sensor signal
right lower segment = maximum magnification position sensor

05. UP/DOWN mechanism Hall-sensor signals & motor drive

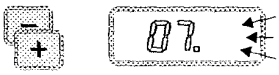


right upper segment = at highest position
right middle segment = lift reference sensor signal
right lower segment = at lowest position
left middle segment = motor rotation sensor signal

06. C-arm mechanism and rotation reference sensor signals & motor drive

right upper segment = arm position to extreme left (-135°)
left middle segment = motor rotation sensor signal
right middle segment = arm rotation reference sensor signal (±10°)
right lower segment = arm position to extreme down (180°)

07. Compression mechanism sensors Hall-sensor signals & motor drive

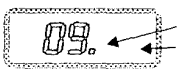


right upper segment =at highest (TWINCOMP release) position
right middle segment = at upper position
right lower segment = at lowest position (full compression)

08. Cassette table size and cassette in place sensor switch signals

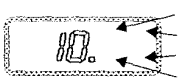
right upper segment = large cassette position switch signal
right middle segment = cassette detector switch signal
right lower segment =small cassette position switch signal

09. Lower compression paddle size sensor switch signals



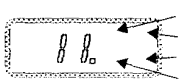
no segments = no paddle inserted
left lower segment =small paddle (left switch)
right lower segment = large paddle (right switch)
both lower segments = paddle tilted upwards

10. Cassette table control switch signals



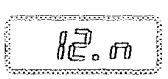
left upper segment =release switch signal
right upper segment = drive unit up switch signal
right lower segment =drive unit down switch signal
left lower segment = compression switch

11. Foot pedal switch signals



left upper segment =left pedal outer edge switch signal
right upper segment = right pedal outer edge switch signal
right lower segment = right pedal inner edge switch signal
left lower segment = left pedal inner edge switch signal

12. Bucky & Stereotactic identification signal



n = 0; no Bucky grid or Stereotactic system connected
n = 1; Bucky grid connected
n = 2; Stereotactic system connected, no needle inserted
n = 3; Stereotactic system connected, needle inserted

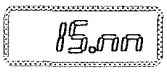
13. Bucky & Stereotactic internal sensor signals

left upper segment = Bucky grid sensor or Stereotactic pulse sensor 1
right upper segment = Stereotactic pulse sensor 2
right lower segment = right side Stereotactic position sensor
left lower segment = left side Stereotactic position sensor

14. Exposure switch signal

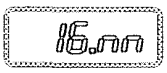
vertical segment =exposure switch signal

15. Keyboard & Lamp test



nn = matrix keyboard scan code All LEDs should be lit on panels

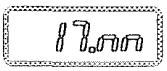
16. Compression force sensor output



nn = hexadecimal value of the compression force sensor signal

This display shows (as a hexadecimal number) the compression force sensor output (used for internal factory tests only).

17. Tube temperature sensor output



nn = hexadecimal value of the tubehead temperature sensor signal

This display shows (as a hexadecimal number) the tube temperature sensor output (used for internal factory tests only).

18. Power supply temperature sensor output

nn = hexadecimal value of the power supply temperature sensor signal

This display shows (as a hexadecimal number) the power supply temperature sensor output (used for internal factory tests only).